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FULL VERSION OF ALL PENDING CLAIMS

1. (Currently Amended) A system for quantifying an evolution of a characteristic of a surface of an object, the system comprising:

an energy source for transmitting a source signal over time to a surface of an object for specular reflection or scattering;

a detector section for receiving a received signal from the surface and for providing a detector signal indicative of the received signal, the detector section receives a plurality of received signals and provides a corresponding plurality of detector signals;
[[and]]

a processor for receiving the detector signal from the detector section, the processor for applying an algorithm to the detector signal to quantify an evolution at least one of a temporal and a spatial change in a characteristic of the surface, the processor applying the algorithm to the plurality of detector signals, the processor includes a peak detector, the processor providing a characteristic signal when a condition of the peak detector is met; and

a computer for receiving the characteristic signal from the processor and for processing the characteristic signal, the computer processing the characteristic signal to at least one of determine a failure precursor, perform a damage prognosis, and perform a remaining-life prognosis.

2. (Original) The system of claim 1 wherein the characteristic of the surface that the processor quantifies is selected from a group consisting of a defect, a slipband, a crack, a microcrack, a pit, a damage feature, corrosion, erosion, a contour change, an impact crater, and a change in residual stress.

3. (Original) The system of claim 1 wherein the energy source and the detector section are installed in situ with respect to the object.

4. (Cancelled)

5. (Cancelled)

6. (Cancelled)

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7. (Currently Amended) The system of claim [[6]]_1 wherein the processor determines which of the detector signals are relevant based on a parameter of the detected signals.
8. (Currently Amended) The system of claim 7 wherein the detector signals have a polarization, and the processor utilizes polarization of the detector signals to determine relevancy.
9. (Currently Amended) The system of claim 7 wherein the detector signals have an incident angle, and the processor utilizes the incident angle of the detector signals to determine relevancy.
10. (Currently Amended) The system of claim 7 wherein the detector signals have a wavelength, and the processor utilizes the wavelength of the detector signals to determine relevancy.
11. (Cancelled)
12. (Currently Amended) The system of claim [[11]]_1 wherein the algorithm includes an additive function for adding the detector signals to provide a sum;
the peak detector providing the characteristic signal when the sum meets a threshold.
13. (Currently Amended) The system of claim [[11]]_1 wherein the algorithm includes an subtractive function for subtracting the detector signals to provide a difference;
the peak detector providing the characteristic signal when the difference meets a threshold.
14. (Currently Amended) The system of claim [[11]]_1 wherein the algorithm includes a multiplicative function for multiplying the detector signals to provide a product;
the peak detector providing the characteristic signal when the product meets a threshold.
15. (Currently Amended) The system of claim [[11]]_1 wherein the peak detector compares each of the detector signals to a threshold and provides a thresholded detector signal when a respective one of the detector signals meets a threshold.

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16. (Original) The system of claim 15 wherein the processor applies an AND function to the thresholded detector signals and provides the characteristic signal as a result of the AND function.

17. (Original) The system of claim 15 wherein the processor applies a summation function to the thresholded detector signals and provides the characteristic signal when the result of the summation function meets a threshold.

18. (Cancelled)

19. (Cancelled)

20. (Cancelled)

21. (Cancelled)

22. (Original) The system of claim 1 wherein the detector section includes a plurality of detectors disposed spatially about the energy source.

23. (Original) The system of claim 1 wherein the detector section includes a plurality of detectors disposed spatially above the surface of the object.

24. (Original) The system of claim 1 wherein the detector section includes an annular detector disposed about the energy source.

25. (Original) The system of claim 1 wherein the energy source includes a light source for providing a source signal that is focused on or near the surface and has a dimension of approximately the same magnitude as that of the characteristic of the surface to be quantified.

26. (Currently Amended) A method for quantifying an evolution of a characteristic of a surface of an object, the method comprising:

transmitting a source signal over time to a surface of an object for specular reflection or scattering;

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detecting a received signal from the surface, the detecting step including receiving a plurality of received signals and providing a corresponding plurality of detector signals;
and

processing a detector signal indicative of the received signal by applying an algorithm to the detector signal to quantify an evolution at least one of a temporal and a spatial change in a characteristic of the surface, the processing step includes processing the plurality of detector signals by applying the algorithm, the processing step includes providing a characteristic signal when at least one detector signal meets a condition, the processing step includes processing the characteristic signal to at least one of determine a failure precursor, determine a damage prognosis, and determine a remaining-life prognosis.

27. (Currently Amended) The method of claim 26 wherein the processing step includes processing the detector signal to quantify a characteristic of the surface selected from a group consisting of a defect, a slipband, a crack, a pit, a contour change, an impact crater, and a change in residual stress.

28. (Cancelled)

29. (Cancelled)

30. (Cancelled)

31. (Currently Amended) The method of claim ~~[[30]]~~ 26 wherein the processing step includes determining which of the detector signals are relevant based on a parameter of the detected signals.

32. (Currently Amended) The method of claim ~~[[30]]~~ 26 further comprising providing a characteristic signal when at least one of the detector signals meets a condition.

33. (Original) The method of claim 32 wherein the processing step includes adding the detector signals to yield a sum, the providing step including providing the characteristic signal when the sum meets a threshold.

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34. (Original) The method of claim 32 wherein the processing step includes subtracting the detector signals to yield a difference, the providing step including providing the characteristic signal when the difference meets the threshold.

35. (Original) The method of claim 32 wherein the processing step includes multiplying the detector signals to yield a product, the providing step including providing the characteristic signal when the product meets a threshold.

36. (Original) The method of claim 32 wherein the processing step includes comparing each of the detector signals to a threshold and providing a thresholded detector signal when a respective one of the detector signals meets a threshold.

37. (Original) The method of claim 36 wherein the processing step further includes applying an AND function to the thresholded detector signals, the providing step including providing the characteristic signal as a result of the AND function.

38. (Original) The method of claim 36 wherein the processing step further includes applying a summation function to the thresholded detector signals, the providing step includes providing the characteristic signal when the result of the summation function meets a threshold.

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Original) The method of claim 26 wherein the transmitting step includes focusing a light beam on or near the surface, the light beam having a dimension that is approximately the same magnitude as that of the characteristic of the surface to be quantified.

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44. (New) The system of claim 3, wherein the energy source and the detector section are installed to provide at least one of continuous and discrete monitoring of the object over a predetermined time period.

45. (New) The system of claim 44, wherein the predetermined time period includes a span of at least a plurality of seconds to a plurality of years.

46. (New) The system of claim 3, wherein the object is measured to quantify at least one of temporal changes and spatial changes in the characteristic of the surface of the object.

47. (New) The system of claim 46, wherein the temporal changes indicate at least one of fatigue damage and surface residual stress.

48. (New) The system of claim 47, wherein the fatigue damage is monitored throughout the component lifetime.

49. (New) The system of claim 47, wherein fatigue damage is monitored using statistical evaluation of the surface roughness.

50. (New) The system of claim 3, wherein the object includes an aircraft component disposed in an aircraft, the energy source and the detector section being installed in the aircraft.

51. (New) The system of claim 50, wherein the aircraft component is a turbine rotor.

52. (New) The system of claim 50, wherein changes in the aircraft component are related to at least one of fatigue loading conditions, impending crack formation, and foreign object damage.

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